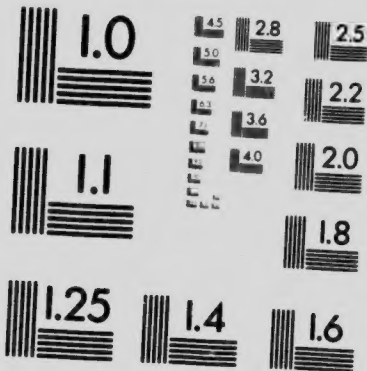


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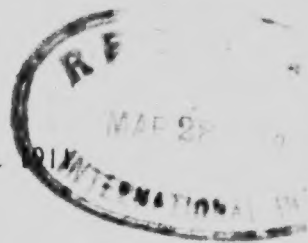


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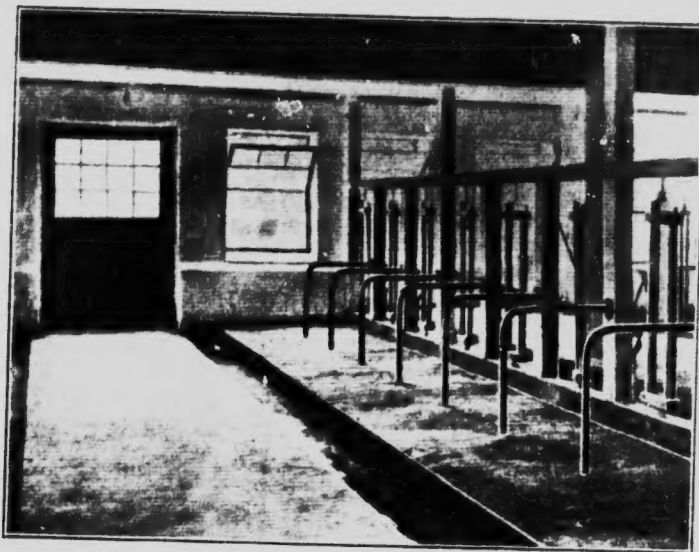
BULLETIN 3

APRIL



# Manitoba Agricultural College

Winnipeg . . . Canada



PORTION OF THE INTERIOR OF A SANITARY STABLE  
Plenty of light, easy to keep clean and a sanitary stable to milk in.

## Care of Milk and Cream

J. W. MITCHELL  
Professor of Dairy Husbandry

Published by authority of the Honourable R. P. R. blin, Minister of Agriculture  
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## Care of Milk and Cream.

There is a very considerable portion of the milk and cream produced in the Province that is used as market milk and cream, or sent to cheese factories, or shipped to creameries. Much of this is not all that it should be when it leaves the farm, and to the extent to which defects exist in it does our dairy industry suffer.

A very material improvement has been effected during the past year in transportation conditions, and, everything considered, this would seem an opportune time to issue a bulletin on the care of milk and cream.

The dairy industry belongs, first and foremost, to the dairy farmer, and the object of this bulletin is to assist him in his work.

The reader will see, in the arrangement of what follows, that we first deal quite fully with defects in milk and their causes and remedies, and, following this, we make application of the principles laid down to the care of market milk and cream, milk for cheese factories, and cream for creameries. We intentionally repeat ourselves to some extent in order to make each section reasonably complete in itself.

The quality of milk and milk products, as regards flavor and purity, is determined partly before the milk is drawn from the cow and partly afterwards, as will be shown presently.

Whether milk is to be used as such, or subsequently manufactured into milk products, it is essential that it be pure, clean in flavor, and not too ripe for the purpose for which it is intended. Let us remember that the finished product can be no better than the raw material from which it comes.

### DEFECTS IN MILK.

The causes of impurities, taints and bad flavors may be classified as follows:

1. The state of health of the cow and the length of time she has been in milk.
2. Food and water.
3. Absorption of taints from an impure atmosphere or from foreign matter that falls into the milk.
4. Undesirable forms of germ life—bacteria, yeasts and moulds—that gain access to milk and its products from a variety of sources. These are known also as ferments.

#### HEALTH OF COW AND LENGTH OF TIME IN MILK.

The health of a cow should be carefully examined into and guarded, as if she be in poor health or be diseased the results are likely to be injurious to her milk and its products. For instance, a quick and radical change in a cow's rations, or allowing her to over-feed when she first gains access to a new pasture, when the grass is plentiful, or possibly wet with dew or rain, may cause indigestion and affect the flavor of the milk. Good judgment should be exercised in feeding and in change of foods and pasture.

Tuberculosis, especially if it be localised in the udder, may affect the milk and render it most unsafe to use. Tuberculous cows should be gotten rid of. Cowpox may be mentioned as another example of a disease of the cow affecting her milk.

Where a cow has been a long time in milk and is near the end of her lactation period this may cause undesirable flavors, such as salt and bitter flavors, especially when she is fed entirely on dry foods. The feeding of clean, wholesome foods, with roots to supply succulency, will often overcome the trouble, but if a cow be close to the end of her lactation period it is well to let her go dry. A cow's milk is not normal, in either flavor or composition, just before or after freshening. It should not be used after she freshens up until it reaches a normal condition, which usually means about five days, and where it is impossible to dry a cow before she freshens her milk should not be used as human food during at least the last fifteen days before she comes in.

## FOOD AND WATER.

Some classes of foods possess strong, objectionable flavors, and when fed to cows impart these to the milk, which in turn passes them on to its products.

The members of the turnip family, for instance, are almost certain to do this. A so many weeds that grow in uncultivated or dirty land will affect the milk. "Stink-weed" serves as a striking example, although there are many others, and weedy pastures are practically certain to contain plants that will impart objectionable flavors to milk.

Of course the prevention is to strive to avoid these sources of trouble. As to turnips, grow them; they are a fine root, but feed them to the stock not producing milk, and grow such roots as mangels and sugar-beets for the cows in milk. As to weeds, from no standpoint can we afford them space on the land.

Since water is the constituent of the blood in which the food, after it is digested, is dissolved and carried throughout the system, and milk itself is composed so largely of water, there being 87 to 88 pounds of water in 100 pounds of average milk, it must be perfectly evident to the thoughtful reader that where a cow has access to impure water it is practically certain to contaminate her milk. Other, and even worse, troubles come from allowing cows to wade into dirty ponds or sloughs to drink. These will be mentioned later. Cows should have a plentiful supply of pure water. It means healthier and cleaner cows, and much poorer milk, as well as a much greater yield.

## ABSORPTION OF TAINTS.

It is a well-established and well known fact that milk will readily absorb taints from an impure atmosphere or from particles of dirt that fall into it. Whether milking be done in a stable or in a yard it is essential that the surroundings be such as to insure as pure an atmosphere as possible. But at best these are not ideal. Hence it is essential to remove the milk from the stable or yard as promptly as possible after milking and keep it where the air is pure.

### GERM LIFE—BACTERIA, YEASTS AND MOULDS.

Most of the changes that take place in milk, after it is drawn from the cow, are due to minute forms of plant life, principally bacterial ferments, which gain access to it and in their growth and development bring about many and varied changes in it and its products. As all air contains bacteria to a greater or less extent no milk is free from them. A change well-known to all is that of the souring of milk, which is due to lactic acid bacteria gaining access to it and converting the sugar of the milk into lactic or milk acid.

These various organisms, when they gain access to milk, find it a perfect food, and if the temperature and other conditions be favorable to their growth they develop very rapidly. Although they are extremely small, single-celled organisms, visible only under a strong microscope, yet their rapidity of growth and reproduction explains the marked changes that often take place in milk within a comparatively short space of time. Their usual method of reproduction is to lengthen somewhat and then divide into two. Under favorable conditions this will take place in from half an hour to an hour's time. Assuming it to take place in an hour's time, and the process to go on at this rate for twenty-four hours, the result would be about 17,000,000 organisms from the one parent organism. Of course as these organisms grow they feed upon the milk and bring about many changes—fermentations—in it which may seriously affect its flavor, change its condition physically, impair its food value, and, if they be disease organisms, render it dangerous to use as a food. This applies to both milk and milk products.

### A BRIEF CLASSIFICATION OF BACTERIA.

From the standpoint of the dairyman, bacteria may be briefly classified as follows:

1. Pathogenic or disease producing bacteria, such as those of tuberculosis, typhoid fever, scarlet fever and diphtheria.
2. Those that produce poisons (ptomaines), not uncommon in ice-cream that has melted and been re-frozen.

3. Peptogenic bacteria, or those that peptonise or digest the casein or curd portion of milk.

4. Putrefactive forms of germ life, which decompose the milk, producing offensive flavors and odors.

5. Butyric ferments or those that act upon the fat of the milk, producing rancidity. All are familiar with the taste and smell of rancid milk, butter and cheese, due to this cause.

6. Bacteria which bring about changes in the color of milk (chromogenic) producing red, blue and other tints.

7. Sweet-curdling bacterial ferments which cause the casein or curd portion of the milk to coagulate without souring. Their action may be compared to that of rennet.

8. Gas-producing organisms. Many of the organisms that produce bad flavors in milk and its products also produce gas. This is particularly noticeable where milk is made into cheese, as the gas is likely to produce holes or openings in it.

9. Lactic acid bacteria which convert the sugar into lactic acid, or cause the ordinary souring of milk.

This is not an exhaustive list, but will prove sufficient to illustrate the many and varied changes in milk and its products, due to the action of germ life—ferments. In fact the problem of ferments and fermentations, and how to control them, is the great task which the dairyman has to face in the handling of milk, the manufacturing of it into its different products, and the care of the same. Some of these organisms are decidedly harmful, and when present in milk make it dangerous to use. Others affect its flavor, rendering it more or less unpleasant to the taste and smell. The great majority, while not specially harmful to a person in vigorous health, depreciate the value of milk as a food and also, when present in too great numbers, set up trouble in the digestive tracts of persons with weak digestion, such as invalids and infants. Others, particularly the lactic acid organisms, are what may be classed as desirable organisms, that is, when not present in too great numbers, and when kept under control, they aid cheese and butter makers in the process of ripening milk and cream for their respective purposes. They are not desirable in milk or cream to be consumed as such, that is, if allowed to develop to any extent they cause it to sour.



*How these Organisms gain access to Milk, and how to prevent and control them.*

Generally speaking, the undesirable organisms may be said to gain access to milk through carelessness and ignorance, and under uncleanly conditions, while the desirable or less harmful organisms gain access under cleanly conditions.

Disease organisms may come from a diseased cow, or from persons who either have a contagious disease or are just recovering from it, or from those who come in contact with disease. Such cows should be disposed of and such persons should have nothing to do with the handling of milk.

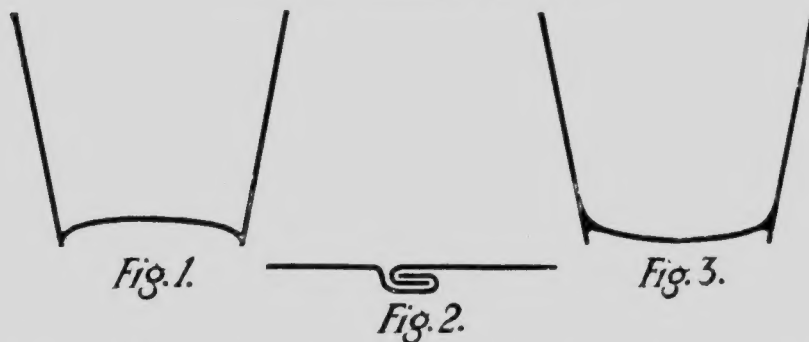
Other forms of germ life gain access to milk in various ways. The following are some of these:—

1. Milking in unclean surroundings, that is, in unclean stables or yards. Milking should always be done in a clean place.
2. The body, udder and teats of the cow being unclean. Keep a cow as clean as possible, and before milking wipe her flank, udder and teats with a clean, damp cloth. A damp cloth will not only clean her best but will dampen her so that particles of dirt adhering to her are not so likely to fall into the milk pail. These particles are laden with undesirable forms of germ life.
3. Milking in a dusty atmosphere. The feeding of dry foods to cows just before milking fills the air with dust particles laden with undesirable bacteria. The feeding of such foods should take place after, not just before, milking. A dusty milking yard is very objectionable.
4. Unclean clothing on the milker is a source of contamination of milk. His clothing and person should be clean.
5. Milking with wet hands. This is a very faulty habit and should be discarded. Liquid dirt is almost certain to drop into the milk where this practice is followed. Try smearing the teats very slightly with clean vaseline, if necessary.

6. Allowing cows to wade into dirty ponds or sloughs to drink. We have mentioned the evil effect of cows drinking such water. Besides this, the dirt in these ponds is composed of the droppings of the cows and other decaying organic matter, laden with putrefactive and other most undesirable forms of germ life, and the dust particles, which adhere to the cow after she dries off, fall into the milk at milking time and are a fruitful source of trouble to the dairyman later on, it being practically impossible to clean the cow sufficiently to avoid this.

7. Faulty and dirty utensils. Use only utensils made of the best quality of tin, and so constructed that they can be easily

PLATE I.  
Desirable and Undesirable Types of Pails.



Figs. 1 and 2 show crevices for the harboring of milk and dirt. Fig. 3 shows a properly constructed pail, with all crevices flushed with solder. Note the difference between the shapes of the bottoms of the two pails. All pails and cans should be made of a good quality of tin, be well constructed and have all seams and crevices flushed with solder.

cleaned. Utensils with the tinning off should be discarded, as it is impossible to keep them clean. There should be no crevices to harbor dirt, but all seams and corners should be flushed with solder.

8. There is one right and many wrong ways of cleaning dairy utensils. There is in milk a substance, albumen, which resembles the white of egg, and hot water will cook this on to the tin. Hence a utensil that has been holding milk or whey should first be rinsed with *cold* or *lukewarm*, not *hot*, water, then washed with hot water containing some good washing powder and then scalded with boiling water or steam, after which it

should be placed in a pure atmosphere, in the sunlight, and in a position to drain. Sunlight is the great natural disinfectant. Use a good fibre brush, and not a cloth, for washing dairy utensils, and never wipe them out after scalding but allow their heat to dry them.

9. Allowing the milk to stand in an impure atmosphere. Not only will milk absorb taints from it, but such an atmosphere is invariably laden with undesirable forms of germ life, which, when they gain access to the milk, set up serious troubles. Milk should be removed from the place of milking immediately after milking, be strained through a clean strainer, and be kept in a clean atmosphere at all times.

10. Dirty strainers. The best cloth strainer to use is one of cheese cloth, as a woolen cloth is very difficult to keep clean. In cleaning such a strainer first rinse with warm water, then wash with water containing a good washing powder, then scald thoroughly and spread out on a line, in a clean atmosphere, in the sunlight. It is a good plan to boil a strainer. Discard a cloth strainer fairly frequently for a new one. Fine brass wire gauze makes a very satisfactory strainer, and is easier than a cloth strainer to keep clean. Perhaps the average person will get better results from this than from a cloth strainer. Don't depend upon a strainer to clean milk. It will not do it. The only way to strain dirt out of milk is to keep it out.

We have pointed out that the various forms of germ life that gain access to milk are the smallest, simplest forms of plant life, we have indicated several of the many ways in which they may gain access to it, and we have shown how to restrict such access. This is the first great step in their control.

But since it is impossible to produce milk entirely free from germ life we should understand how to control, or hold in check, those that do gain access to it. Like all other forms of life they require, for rapid development, suitable food, in a suitable condition, and a suitable temperature. They find the food conditions practically ideal in milk. Hence to destroy them, or prevent or check their growth, we must make the temperature unsuitable. The higher the temperature, up to 90 or

100 degrees Fah., the more favorable they find it. A sufficiently high temperature will destroy them, and this is what is aimed at in the pasteurization of milk—heating it to 140 degrees Fah., or above while low temperatures prevent or retard their growth but do not destroy them. City dairies combine these two principles; that is, they first pasteurize the milk or cream, to destroy the germ life in it in as large a measure as possible, and then cool it promptly to a low temperature, put it into clean, sterilized containers, with close covers, and hold it at a low temperature until delivered to the consumer.

To sum up, the factors in the hands of the producer of milk are, the production of pure, clean-flavored milk, as free of germ life as possible, keeping it in clean vessels and clean surroundings, prompt cooling, and holding at a sufficiently low temperature to prevent the development of those organisms that do gain access to it.

## **Market Milk and Cream**

This side of our dairy industry has already reached no mean proportions, and is rapidly increasing in magnitude.

Since milk forms such an important part of the food of adults, children and infants, and its very delicacy and completeness as a food renders it susceptible to so many influences, too great attention cannot be given to its production and care. Important responsibilities devolve upon *all* who have to do with the handling of it—the *producer*, the *vender* and the *consumer*.

Our city health officials and many intelligent, conscientious producers and vendors are unitedly making an honest effort to improve the quality of the milk and cream offered for sale.

In application to this side of our dairy industry of the principles already discussed, we would make the following notes:

1. Only the product of cows free from disease should be offered for sale.

2. Persons having, or coming in contact with, contagious diseases should have nothing to do with the handling of milk.
3. No foods should be fed that will injure the flavor of the milk. Such foods as musty or mouldy hay, turnips, decayed roots and many weeds injure the flavor of milk.
4. A pure water supply is essential for the production of pure milk.
5. The stable or the yard in which the milking is done should be in a thoroughly sanitary condition. Where cows are housed as long as we have to house them in this country the stable itself and its surroundings should be carefully considered. Place the stable on high ground, with clean surroundings, and, if possible, with a southern outlook. If necessary gravel the yard. The stable must be both comfortable and sanitary if we are to produce milk economically and have it of good quality. Make it warm; put in a good cement floor; construct the mangers so that they can be kept clean, and keep them clean; provide suitable, sanitary watering troughs; make provision for plenty of light, particularly on the south side if possible; provide sufficient space, 500 to 700 cubic feet for each animal, according to the size of your cows; make the ceiling close, particularly if there be a loft above, and ventilate the stable properly. A good system of ventilation will provide for the bringing in of fresh air and the carrying off of foul air, without drafts and without undue waste of the warm air of the stable. The King and Rutherford systems are the two mostly in use, and a study of these is recommended. Whitewash the walls and ceiling of the stable every fall at least.
6. Use clean bedding for the cows.
7. Take the manure out of the stable daily. Don't do this just before milking.
8. Keep the cows clean. It pays to use the curry-comb on them, but don't do this just before milking.
9. Wipe the cows' udders, teats and flanks with a damp cloth just before milking. If very dirty *wash* these parts, and wipe afterwards. It is advisable to cut a cow's switch off in the fall, and also to clip the hair on her udder.

10. Don't feed dry foods just before milking. The dust from hay is laden with harmful bacteria.

11. Only tin utensils, of good quality and well constructed, should be used for milking into and for holding milk, and these should be thoroughly clean. See instructions on page 9 for the cleaning of utensils. Don't use wooden or galvanized-iron pails as milk pails. A small-mouthed pail, such as that in

PLATE II.  
Milk Pails.



Fig. 1 - Open pail.



Fig. 2 - Lox pail.

Fig. 1 is an ordinary pail twelve inches in diameter. Fig. 2 is the same pail with a cover or hood in which is an elliptical opening about five by seven inches. Such a pail, used for milking purposes, reduces the particles of dust and dirt and the number of bacteria that gain access to the milk at milking time by considerably over fifty per cent. This style of pail is convenient to milk into. It should not be over twelve inches in height, over all.

the accompanying illustration, is much preferable to one with a wide mouth, as it prevents germ life, to a large extent, from falling into the milk.

12. The person of the milker should be clean.

13. Milking should always be done with dry hands. Wet milking is a dirty habit. Try slightly smearing the teats with vaseline if necessary.

14. While it is important that milking should be done in a clean place, the milk should be removed from the place of milking promptly afterwards to still cleaner surroundings, be at once strained through a clean strainer; such as three or four plies of cheese cloth or a fine brass gauze strainer, then be promptly cooled to 50 degrees, or below, and held at this tem-

perature until delivered or shipped. Prompt cooling is quite as important as the temperature cooled to. Those producing milk for city distribution should store ice, as the best plan of cooling is to set the milk cans in a tank of water containing a plentiful supply of ice. The water in the tank should be as deep as the milk in the cans. The tank should have an overflow pipe, and be protected from the weather. It is well to cover the cans when beginning to cool the milk, or soon after. Aeration of milk usually does more harm than good.

15. When shipping cream instead of milk separate promptly after milking and give the cream the same care you would give milk. A fairly rich cream will keep better than thin cream, say cream testing 30 to 35 per cent.

16. The separator parts should be thoroughly clean and the separator should be kept in a clean place. Clean the parts of the separator every time it is used just as you would other dairy utensils.

17. Milk and cream cans should be covered while on the road to protect them from the summer sun, the extreme cold of winter, and dust and dirt. Nor should they be delivered to the station long before train time. While standing at a station awaiting a train they should be placed under cover.

18. The more securely milk is covered during delivery to the consumer, the better, as exposure to the germ-laden dust of the streets is dangerous. Where practicable, milk for the retail trade should be delivered in clean, sterilized bottles.

19. Immediately upon its receipt by the consumer, milk or cream should be put in a clean, cool place—in a refrigerator if there is one—and it is well not to open a bottle until it is needed for use. Lack of prompt attention is a frequent cause of milk going wrong in the home.

May we not state the conclusion of the whole matter in the words: **CLEAN MILK; COOL MILK.** This will insure **GOOD MILK.**

## **NOTES ON MILK FOR CHEESE FACTORIES**

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1. Cheese can be no cleaner in flavor and no purer than the milk from which it is manufactured.
2. To produce pure milk a cow must be healthy and must receive clean-flavored food. One trouble we have to contend with is weedy pastures. Clean-flavored milk cannot be produced from pastures containing strong-flavored weeds, such as "stink-weed."
3. Pure water is essential for the production of pure milk.
4. Another trouble is dirty stables and milking yards. If milking in a stable keep it clean, and when necessary make a change of yard.
5. Have the cows clean for milking. Wipe a cow's udder, flank and teats off with a clean, damp cloth before milking. This is essential for the production of clean milk.
6. Use only *tin* pails, with the tinning on, for milk pails, and make sure that they are thoroughly clean. Never use wooden or galvanized-iron pails as milk pails. The use of rusty milk cans, or of cloth on a defective cover, should never be allowed.
7. Do the milking with dry hands. Don't wet a cow's teats. Try smearing the teats slightly with vaseline if necessary.
8. Remove the milk from the stable or yard immediately after milking, strain it through a fine brass wire gauze strainer, or else three or four plies of cheese cloth, into the milk-can and immediately cool the evening's milk to about 65 degrees Fah., when it is to be delivered the next morning, and to 50 degrees if it is to be held a longer time, and hold it at the temperature cooled to. A tank should be provided for this purpose. Cover the can when beginning to cool the milk, or soon after. Aeration usually does more harm than good. Don't mix the warm morning's milk with the evening's milk if you can avoid it. When necessary, delay doing so until just before sending it to the factory.



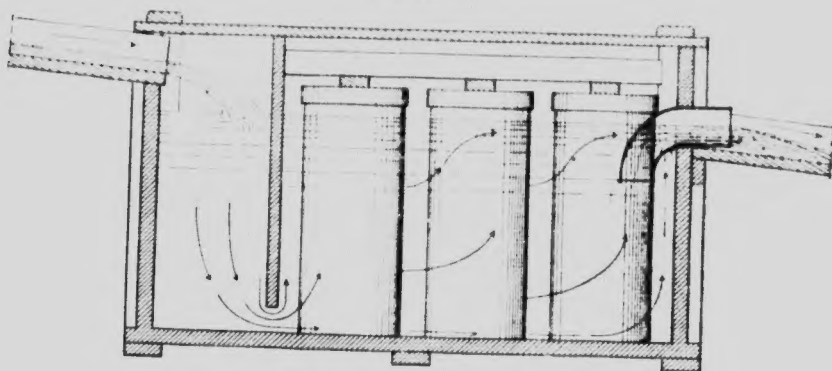
9. Where whey is taken back from the factory in milk cans special care must be taken in the cleaning of them. In cleaning dairy utensils rinse them with cold or luke-warm, not hot, water, then wash them with hot water containing a good washing powder, then scald them thoroughly, after which they should be placed in a pure atmosphere, in the sunlight, and in a position to drain. Don't wipe them out after scalding. Use a fibre brush, and not a cloth, for washing them.

10. The same sanitary conditions should prevail at the factory as at the farm. Defects in cheese are often due to dirty factories and factory utensils, defective drainage, floors, gutters, vats and whey tank and impure water.

11. The site of a factory should be high, to permit of good drainage, and good tile (not open) drains should be used.

12. There should be a plentiful supply of pure water provided at a factory.

PLATE III.



**A Tank for Cooling Milk or Cream**

by means of water pumped into it and allowed to overflow to a watering trough. Where the cooling is done by means of water and ice, the partition indicated is unnecessary. The tank is made of wood and lined with galvanized iron. It should have a good hinged cover. We strongly recommend the use of an insulated tank, made by using four-inch studding for the sides and bottom, boarding outside and in, and filling the space between with dry mill shavings or sawdust. This prevents the temperature from rising rapidly and means a great saving of ice. The tank should be placed under cover in clean surroundings. Separate cans, such as shotgun cans, should be used instead of the shipping cans for cooling cream and holding it until shipped.

13. Factory floors should be close and the gutters good. A good cement floor is perhaps the most sanitary.

14. Leaky vats cannot be too strongly condemned, and vats with the tinning badly worn off should be relined.

15. All whey tanks should be well constructed, should be so placed that they can be drained out, and should be washed frequently to keep them clean.

16. Leaky whey tanks are too common. The ground about them is a regular breeding ground for flies and germ life, thus making the atmosphere about the factory very impure.

17. All factories should have screen doors and windows to keep flies out, and factories should be kept as free from flies as possible. Where flies fall into the vat they seed the milk with most undesirable bacteria, which often cause serious trouble. Defects in cheese have been traced direct to this source of infection.

18. A defective, bad-flavored starter will do as much harm as a good starter will do good.

A good combination — CLEAN MILK, COOL MILK, CLEAN FACTORIES.

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## **CREAM FOR CREAMERIES**

The making of butter begins, not when the cream is put into the churn, but with the production of the milk. Co-operative dairying in Manitoba must, of necessity, take the form mainly of the cream-gathering creamery; and since the farmer has the production of the milk, the creaming of it, and the care of the cream until it is sent to the creamery, he becomes a large factor in determining the quality of the butter manufactured.

### *Notes on the Care of Cream.*

1. The first step in the making of good butter is the production of pure, clean-flavored milk. See notes on "Milk for Cheese factories."

2. Remove the milk from the stable or yard immediately after milking, strain it and put it through the separator as promptly as possible, while fresh and warm. It will separate best under these conditions.

3. Keep the separator in a clean place and thoroughly clean it every time it is used. See that it is running smoothly and at the right speed. This will insure close skimming, add to the life of the separator, and make it run more easily.

4. Take a fairly rich cream, cream which contains about 35—not less than 30—per cent. butter fat, or which will make about four pounds of butter to the gallon of cream. This usually means from 10 to 12 pounds of cream from 100 pounds of milk. Such cream will keep better and will churn at a reasonably low temperature, thus doing much to insure a good quality of butter.

5. Immediately after separation cool the cream to 50 degrees or below, keeping it in a separate can until this is done. Cover the can.

6. It may then be put into the larger lot of cream. This cream should be held at a low temperature until sent to the creamery. Stir it every time a new lot is added to it.

7. The best way to cool cream and hold it at a low temperature is to put it into a tank of water containing a plentiful supply of ice, the water surrounding the can being as deep as the cream in it. See illustration of a suitable cooling tank on page 16. Keep cream covered at all times.

8. Cream cans should be protected from the sun in summer, the mud in the fall and spring, and the extreme cold in winter, while in transit to the creamery. If sending cream by train don't deliver it at the station several hours before the train is due. Where it has to stand any length of time awaiting the arrival of a train, cream should be placed under cover.

9. Cream should be both sweet and clean in flavor when sent to the creamery. Don't hold it too long before shipping, as such flavors as bitterness may develop even though it does not sour. If possible deliver cream three times a week in summer and twice a week in winter.

A good motto for creamery patrons—**CLEAN CREAM,  
SWEET CREAM, FREQUENT DELIVERY.**

*Note on the Difference between Butter and Butter-Fat.*

We have been requested by different parties to add a note distinguishing between butter and butter-fat.

The composition of average butter is about as follows:

Butter-fat, . . . . .	84%
Water, . . . . .	12%
Salt, . . . . .	3%
Casein, . . . . .	1%
Total, . . . . .	100%

From this we see that there are about 84 pounds of fat in one hundred pounds of average butter. Butter varies considerably in its composition.

If from a given lot of cream, containing 100 pounds of fat, are made 117 pounds of butter, the "over-run" is 17 pounds of butter on 100 pounds of fat, or 17 per cent. The over-run is greatly influenced by such factors as the losses sustained and the amount of moisture incorporated in the process of manufacture, which process begins with the handling of the milk and ends with the finished product.

In conclusion we beg to acknowledge that the cut of a stable interior, shown on the front page, was taken from Bulletin 13 of the Live Stock Commission's Branch, and the cut of a cooling tank from Bulletin 15 of the Dairy and Cold Storage Commissioner's Branch, Department of Agriculture, Ottawa.